

Register No.: Name:

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

SECOND SEMESTER B.TECH DEGREE EXAMINATION (R), MAY 2023**(2020 SCHEME)****Course Code : 20CYT100****Course Name: Engineering Chemistry****Max. Marks : 100****Duration: 3 Hours****PART A*****(Answer all questions. Each question carries 3 marks)***

1. What is electrochemical series? List its two applications.
2. List any three advantages of electroless plating.
3. A solution of a substance of concentration 0.04 M shows absorbance of 0.045 at 540 nm, while a test solution of the same substance shows absorbance of 0.022 under same conditions. Find the concentration of test solution.
4. How many signals will appear in the proton NMR spectrum of ethyl chloride ($\text{CH}_3\text{CH}_2\text{Cl}$)? Draw its splitting pattern.
5. Differentiate between retention time and retention factor. What is the significance of these parameters in chromatography?
6. Draw the TGA curve of $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$ and mention the relevant equations.
7. How ABS polymer is prepared? Write one use of ABS.
8. What are doped conducting polymers? How doping is done in polymers?
9. List three disadvantages of using hard water for industrial purpose.
10. Find the BOD of water sample containing 120 mg of carbohydrate (CH_2O) per liter.

PART B***(Answer one full question from each module, each question carries 14 marks)*****MODULE I**

11. a) Explain the construction and working of saturated calomel electrode as a reference electrode and explain how the measurement of unknown electrode potential is carried out using saturated calomel electrode? (10)
b) Derive Nernst equation for single electrode potential. (4)

OR

12. a) Explain the principle and procedure for potentiometric estimation of a solution of ferrous ions using a suitable oxidizing agent. (10)
- b) Explain the following terms used in electrochemistry (4)
- i) Impressed current cathodic protection ii) Redox electrode

MODULE II

13. a) What is the principle of IR spectroscopy? Draw the IR active and inactive vibrational modes of CO₂ and H₂O. Calculate the force constant of the carbon monoxide (CO) molecule which absorbs infrared radiation at 2140 cm⁻¹, given atomic masses of C and O are 12 u and 16 u respectively and 1u=1.67×10⁻²⁷Kg. (10)
- b) Explain the principle of proton NMR spectroscopy. (4)

OR

14. a) Explain the various electronic transitions possible in organic molecules and list any three applications of UV-Visible spectroscopy. (10)
- b) Explain the instrumentation of a double beam UV-Visible spectrometer. (4)

MODULE III

15. a) Explain the instrumentation of DTA with the help of a block diagram. Draw the DTA curve of calcium oxalate monohydrate and mention the relevant equations. (10)
- b) Draw a labelled block diagram of SEM. List any two applications of it. (4)

OR

16. a) Explain the components of chromatographic instruments- HPLC and GC with the help of block diagrams. Explain the principle of separation taking place in each. (10)
- b) Write the reduction method for the synthesis of nanoparticles. (4)

MODULE IV

17. a) Explain the conformational analysis of ethane and n-butane. Arrange the conformers of each molecule based on stability with justification. (10)
- b) How copolymers are classified based on the pattern of arrangement of repeating units? (4)

OR

18. a) Explain the preparation, properties and applications of polyaniline and Kevlar. (10)
- b) Describe the working of OLED with the help of a labelled diagram. (4)

MODULE V

19. a) Explain trickling filter and UASB techniques for the treatment of sewage water with the help of appropriate diagrams. (10)
- b) Calculate the total hardness of the given water sample, if 20 mL of sample water gives endpoint with 18.5 mL EDTA solution. 20 mL standard hard water of concentration 0.0120 M gives end point with 22.1 mL of same EDTA solution. (4)

OR

20. a) Write the principle and procedure for estimating total hardness of water. How the ions causing hardness are removed using ion exchange resins? (10)
- b) Explain breakpoint chlorination. What is its significance in the disinfection of water? (4)
